

PATENT SPECIFICATION

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(54) FUNGICIDES FOR CONTROLLING TAPPING PANEL DISEASES

(71) We, THE BOARD OF THE RUBBER RESEARCH INSTITUTE OF MALAYSIA, a Malaysian Body Corporate or 260 Jalan Ampang, Kuala Lumpur, Malaysia, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to compositions that will prolong the period of effectiveness of fungicides used for controlling stem diseases of *Hevea brasiliensis* in particular diseases on the tapping panel.

The best known disease on the tapping panel is black stripe or black thread caused by *Phytophthora palmivora*. In severe infections, large areas of renewing bark can be destroyed and failure to control it will result in depressions and burrs on the renewed panel rendering future tapping difficult. The disease is particularly active during the rainy season.

At present, control of black stripe is achieved by applying 0.5% by weight Antimucin (containing 10.0% by weight phenyl mercury acetate), 0.5% by weight Actidione (containing 4.2% by weight cycloheximide) or 2.0% by weight Difolatan registered Trade Mark (containing 40% by weight captafol) in water every two days until the disease has disappeared completely. The high frequency of application is required because the fungicide gets washed away rapidly by the frequent rains that characterise the disease season. Thus the costs for labour and chemical are high, making control of black stripe an expensive item in plantation upkeep. To overcome these drawbacks, attention has recently been directed to developing more persistent formulations for the above fungicides, in order to bring a reduction in the frequency of treatment.

The present invention provides an oil in

water emulsion containing a vegetable oil, a hydrophilic colloid and a fungicide selected from phenyl mercury acetate, cycloheximide, and captafol, for application to *Hevea brasiliensis*.

The vegetable oil provides a water-repellant barrier that reduces the wash-out by rain. Suitable vegetable oils include palm oil, palm kernel oil and coconut oil.

The hydrophilic colloid provides the means for sustained leaching of the chemical to impinge on the affected site. Suitable colloids include alkyl and hydroxyalkyl cellulose derivatives, and polyvinyl alcohol.

The bulk of the emulsion is water. Emulsification of the oil and water phases may be achieved by means of an emulsifying agent. The choice of emulsifier is not critical provided that adequate emulsion stability is achieved.

The fungicide is phenylmercury acetate, or cycloheximide, or captafol which are effective against diseases of the stem and tapping panel of *Hevea brasiliensis*.

The ingredients may suitably be present in the following amounts (in parts by weight)

- Water: 75
 Vegetable oil: 8 to 35, particularly 15 to 20
 Emulsifier: 2 to 15% by weight of the oil
 Hydrophilic colloid: 0.5 to 5.0 particularly 1.5 to 2 (dry solids basis)
 Fungicide: as required

The emulsion may also contain an anti-oxidant, a bactericide, an insect repellent, an animal repellent, and such solvents as are necessary to produce a compatible mixture.

The invention also provides a method of treating *Hevea brasiliensis*, particularly in order to treat tapping panel diseases which method comprises applying to the tree an

effective amount of an emulsion as herein described.

It has been observed that the formulation containing Actidione, Difolatan or Antimucin is also effective in controlling panel disease commonly known as mouldy rot caused by *Ceratocystis fimbriata*.

Apart from black stripe and mouldy rot, it is interesting to note that phenylmercury acetate in the same formulation also gave effective control of another important stem disease known as bark necrosis. The causal agent of this disease is not known for certain, but effected area of the trunk bleeds and rots, resulting in the death of the tree if it is not effectively treated in time.

After some experimentation, a preferred formulation (hereinafter referred as PY formulation) was obtained. Unlike most film-forming materials which seal-off the active ingredient, the formulation here allows for continual leaching of the fungicide to the affected site of the panel to take place. Trials conducted on artificially induced and naturally occurring diseases on the tapping panel have concluded that all

three chemicals in PY formulation gave good control when applied at 6-daily intervals. Details of the formulation are as follows:—

Constituents	Concentration (% by weight)
Palm-kernel oil	15—20
Triton (registered Trade Mark) X 207 (an emulsifier)	35—45
Water	0.5—2.0
Hydroxyethyl cellulose (5% solution)	30—40
Either Antimucin or Actidione or Difolatan	0.5—0.75 0.5—0.75 2.0—3.0

EXAMPLES.

The following results illustrate the prolonged efficacy of the formulation.

(I) A trial was conducted on artificially induced disease using 20 trees per treatment. Assessment was carried out 6 weeks after the initiation of the trial. The results are tabulated below:—

Fungicide in PY formulation	Concentration (% by weight)	Application intervals (days)	Disease score (%) on the day of assessment
Antimucin	0.5	4	7
Antidione	0.5	4	21
Difolatan	2.0	4	10
Difolatan	2.0	6	10
Control (No treatment)	—	—	58

(II) Another trial was conducted later at the same site on mildly infected trees (again by artificial inoculation), where application of 2% Difolatan in the same formulation at 6-daily intervals eradicated the disease completely compared with 48% infection in control trees on the day of assessment 6 weeks after the treatment.

(III) The third trial was conducted on naturally infected trees. Control trees here were given the standard treatment of Difolatan in water alternate daily. Assessments were carried out 3 weeks and 6 weeks after the initiation of the trial. Particulars of the treatments and results are tabulated below:—

Fungicide in PY formulation	Concentration (% by weight)	Application frequency	Initial disease score (%)	Disease score (%) after	
				3 weeks	6 weeks
Antimucin	0.75	Every 6 days	100	37	12
Actidione	0.75	Every 6 days	91	12	12
Difolatan	3	Every 6 days	100	9	28
Control-Difolatan in water	2	Every 2 days	98	42	51

The results of all the three trials have consistently shown that PY formulation can reduce the frequency of application to 6-daily interval and still give better control than the hitherto recommended alternate daily treatment with the same fungicides carried in water.

WHAT WE CLAIM IS:—

1. An oil-in-water emulsion containing a vegetable oil, a hydrophilic colloid and a fungicide selected from phenyl mercury acetate, cycloheximide and captafol, for application to *Hevea brasiliensis*.

2. An emulsion as claimed in claim 1 wherein the ingredients are present in the following proportions (parts by weight):—

Water: 75

Vegetable oil: 8 to 35

Emulsifier: 2% to 15% by weight of the oil

Hydrophilic colloid: 0.5 to 5.0 (dry solids basis)

Fungicide: as required.

3. An emulsion as claimed in claims 1 or 2, wherein the following constituents are present

Constituent	Concentration (% by weight)	
Palm kernel oil	15—20	30
Emulsifier	0.5—2.0	
Water	35—45	
Hydroxyethyl cellulose (5% by weight aqueous solution)	30—40	35
Either phenyl mercury acetate or 4.2% by weight cycloheximide or 40% by weight captafol	0.05—0.075 0.5—0.75 2.0—3.0	40
4. A method of treating <i>Hevea brasiliensis</i> , which method comprises applying to the tree an effective amount of the emulsion claimed in any one of claims 1 to 3.		45

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